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Two Pycnogonids (Arthropoda) from the Coral Sea Region: a New *Callipallene* and a Reassessment of the *Anoplodactylus cribellatus* Complex

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Pycnogonid material from New Caledonia and the Great Barrier Reef has been examined. *Callipallene ersei* sp. nov. is described from the infralittoral sand of New Caledonia. Specimens from both regions have allowed the reassessment of *Anoplodactylus* species with more than 10 cribellate cement gland pores per femur: all (other than *A. laciniosus* Child, 1995) are assigned to *A. cribellatus* Calman, 1923, including *A. perforatus* Nakamura and Child, 1982 and *A. simplex* Clark, 1963 as junior synonyms.

Key Words: Pycnogonida, *Callipallene*, *Anoplodactylus*, multicribellate, Australia, New Caledonia.

Introduction

The Coral Sea region of the southwestern Pacific has had an intermittent history of pycnogonid taxonomy. The Australian east-coast fauna was studied by Clark (1963) and more recently by Staples (1982); the fauna of New Caledonia has been described by Child (1977) and Stock (1991) (plus a deep water record of *Colossendeis macerrima* Wilson, 1881 in Stock 1994).

The present material, of 36 specimens representing two species, was collected by Dr Christer Erséus from New Caledonia and the Great Barrier Reef in 1993 and 1995, respectively, and kindly made available to me for study. The material included a new species of *Callipallene* Flynn, 1929. Other specimens have allowed a reassessment of those Indo-West Pacific species of *Anoplodactylus* Wilson, 1878 with very numerous cement gland pores (the multicribellate state). Type material has been deposited in the National Museum of Wales, Cardiff (NMW).

Callipallenidae Hilton, 1942

Callipallene ersei sp. nov.
(Fig. 1)

Material: 1♂ [Holotype] (Accession No. NMW-Z-1997.008.1); 1 gravid ♀ [Allotype] (NMW-Z-1997.008.2); 10♂♂ (1 ovigerous, 3 larvigerous), 11♀♀ (3 gravid), and 9 juveniles [Paratypes] (NMW-Z-1997.008.3); east of Ilot Ain, south end of Grand Récife Mengalia, off Touho, New Caledonia, 20° 45.1'S, 165° 16.0'E, barely

subtidal, greyish, poorly oxygenated, coarse sand; 14 September 1993; coll. Christer Erséus (station NC93-9).

Description: Trunk (Fig. 1B) compact, unornamented, with sutures between first three trunk segments only. Cephalon comprising about half of the trunk length, with

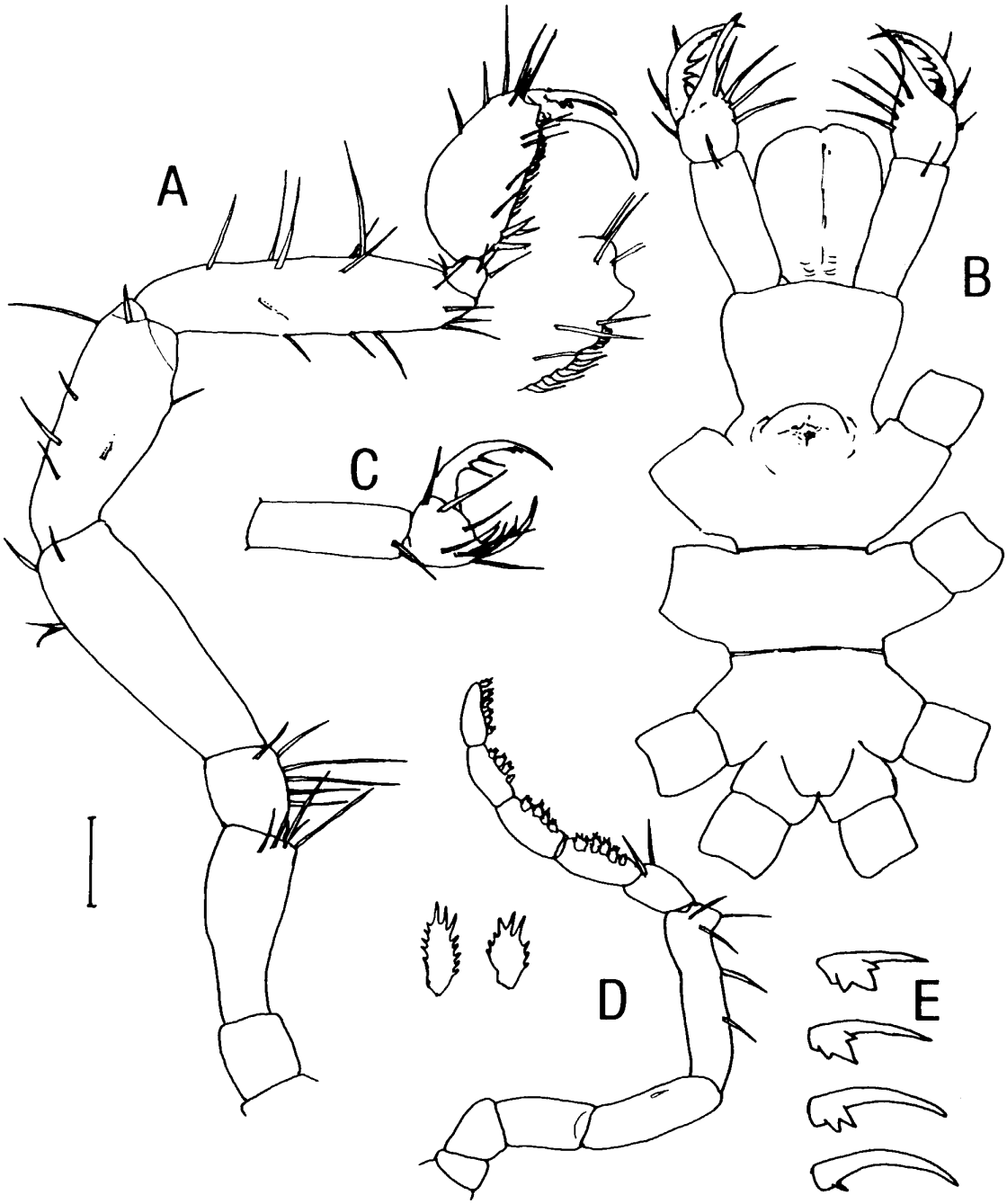

Fig. 1. *Callipallene ersei* sp. nov., male. A, third leg, with detail of propodal lamina; B, trunk, dorsal; C, chelifore, lateral; D, oviger, with detail of proximal (left) and distal (right) compound spines; E, auxiliary claws of (top to bottom) 1st to 4th legs. Scale line = 0.1mm for A to D, 0.05mm for E.

crop. Ocular tubercle a low dome, eyes present but poorly pigmented (in preserved material). Abdomen very short, naked. Proboscis barrel-shaped, about two-thirds as long as cephalon.

Chelifore (Fig. 1B, C) scape 3 to 3.5 times as long as wide, reaching tip of proboscis, with 1 or 2 distal setae. Chelae large, well-developed; palm bearing 7 dorsal and lateral setae longer than scape diameter; fixed finger slender, as long as palm, with 3 slender, seta-like teeth on cutting edge; moveable finger slender, curved, longer than palm, with 2 or 3 slender, seta-like teeth centrally and 2 shorter teeth distal to these; finger tips crossing.

Palp absent.

Oviger (Fig. 1D) 4th article 1.5 times as long as 3rd, 5th 1.5 times as long as 4th and with 4 ventral to lateroventral setae and distal apophysis bearing a seta; 6th article as long as 2nd; strigilis articles together longer than 6th, decreasing in length distally, armed with denticulate compound spines numbering 5:4:4:6 to 5:5:5:6; spines with short lateral serrations and more elongate distal serrations.

Third leg (Fig. 1A) coxa 1 short, naked; coxa 2 2.5 times as long as coxa 1, bearing 4 or 5 ventrodistal setae as long as greatest width of coxa; coxa 3 slightly longer than coxa 1, with 1 distal and 5 ventral setae, the longest 1.5 to 2 times longer than coxal width; femur stout, 2.8 times as long as wide; tibia 1 shorter than femur; tibia 2 longer than femur, bearing numerous long setae; tarsus short, with dorsal and ventrodistal setae but no spines; propodus compact, without heel, but with 3 stout heel spines, 6 to 7 sole spines, and a short, distal lamina. Main claw curved, 0.7 times length of propodus; auxiliary claws proportionately increasing in length from 0.43 length of main claw on first leg to 0.63 on fourth leg; auxiliary claws basally denticulate (Fig. 1E), those of first leg bearing tridentate process, those of second leg with either tridentate or bidentate process, those of third leg with bidentate process, those of fourth leg with single tooth.

No trace of cement gland ducts. Ovigerous/larvigerous males carrying between one and four eggs/larvae.

Measurements of male paratype, μm:

Body length (anterior of cephalon to tip of 4th lateral process): 640
Width across second lateral processes: 290
Length of abdomen: 44
Proboscis length: 197

Oviger article 1 (O1)	36	Third left leg:	
O2	57	coxa 1	85
O3	87	coxa 2	214
O4	146	coxa 3	95
O5	205	femur	294
O6	60	tibia 1	270
O7	76	tibia 2	322
O8	71	tarsus	31
O9	70	propodus	185
O10	64	main claw	120
		aux. claw	68

Width coxa 3: 65; coxa 3 setal length: 120

Etymology: The species is named after Dr Christer Erséus of the Swedish Museum of Natural History, who kindly supplied the specimens (amongst others).

Remarks: *Callipallene ersei* sp. nov. shows distinct affinities to *C. tridens*

Nakamura and Child, 1988a from the Ryukyu Islands: of the 31 described species of *Callipallene*, only these two species share compound auxiliary claws, a low, domed ocular tubercle, a short, distal sole lamina, a ventrally hirsute coxa 3, and elongate chela fingers with long, spine-like chela teeth. Indeed, the last four characters have not been recorded for any other species.

Callipallene tridens has its auxiliary claws reduced to short, spatulate tridents, while those of *C. ersei* are normal auxiliaries, about half as long as the main claw, with toothed processes at the base, those of the first leg of similar morphology to the auxiliaries of *C. tridens*, those of the third leg bidentate, and those of the fourth leg constituting a single tooth; the auxiliaries of the second leg are either bidentate or tridentate (including both types on the same animal).

Apart from the auxiliary claws, *C. ersei* is distinct from *C. tridens* in having a femur shorter than tibia 2 (longer than tibia 2 in *C. tridens*), a proportionately longer 4th oviger article and less elongate leg articles. The peculiarly (for the genus) elongate and hirsute chelae, again common to both species, presumably show some adaptive morphology, but, other than their shallow occurrence, nothing is known of the ecology of these animals.

Simply denticulate or pectinate auxiliary claws also occur in *C. californiensis* (Hall, 1913), *C. panamensis* Child, 1979, *C. pectinatus* (Calman, 1923), and *C. phantoma* (Dohrn, 1881), the last two of which show the same variation in auxiliary claw proportional length found in *C. ersei*. None of these species has the elongate, spinose chela, the propodal lamina, nor the ventrally hirsute coxa 3 shown by both *C. ersei* and *C. tridens*.

Phoxichilidiidae Sars, 1891

Anoplodactylus cribellatus Calman, 1923
(Fig. 2)

A. cribellatus Calman, 1923: 285; Kurian 1948: 195; Kurian 1953: 764; Daniel and Sen 1980: 164.

A. simplex Clark, 1963: 50; Staples 1982: 461 - new synonymy;

A. perforatus Nakamura and Child, 1982: 289; Nakamura and Sekiguchi 1983: 39; Miyazaki and Makioka 1988: 15; Nakamura and Child 1988a: 663; Nakamura and Child 1988b: 813; Nakamura and Child 1991: 29 - new synonymy.

Material: 1 ovigerous ♂, reef platform northeast of Ilot Ouao, off Kombounou, Touho, New Caledonia, 20° 42.9'S, 16.1'E, barely subtidal, greyish coarse sand, 17 September 1993. 1 ♀, lower intertidal, heterogeneous sediment, largely coarse sand, and 1 ovigerous ♂, 1 ♀, barely subtidal, heterogeneous sediment, largely fine sand, west of sand bar at northern tip of Palfrey Island, Great Barrier Reef, 14° 41.5'S, 145° 26.8'E, 2 October 1995; coll. Dr C. Erséus (sample stations NC93-34, LI95-16, and LI95-17 respectively).

Remarks: The Great Barrier Reef and New Caledonia specimens are consistent in having auxiliary claws, a tiny distal propodal lamina, propodal heels with 1 large and 1 smaller pair of spines, trunk sutures 1+2 only, no lateral process tubercles but a single dorsodistal seta, long chelifores, elongate ovigers with a suggestion of an atrophied articulation proximally on oviger article 3, no ♀ ventral proboscis

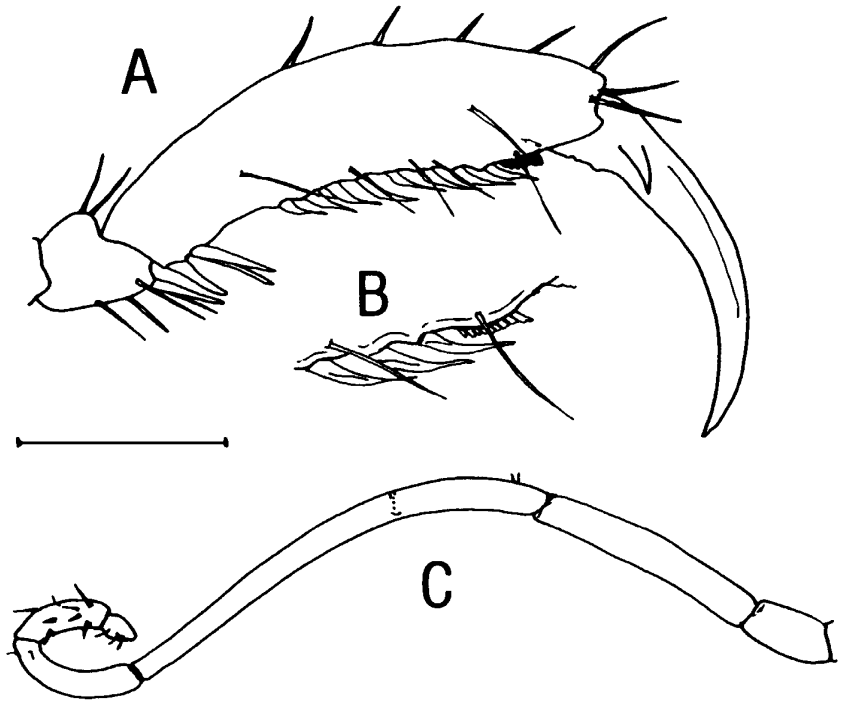

Fig. 2. *Anoplodactylus cribellatus* Calman, 1923, male from New Caledonia. A, distal articles of 3rd leg; B, detail of lamina; C, oviger. Scale line = 0.2mm for A, 0.1mm for B, 0.5mm for C.

processes, no chela teeth but moveable finger longer than fixed finger, and a row of 16 to 18 small "cribellate" femoral cement gland pores.

There are four described species of *Anoplodactylus* with more than 10 cement gland pores per femur. *Anoplodactylus laciniosus* Child, 1995 from the Antipodes Islands (12 to 14 pores) is of the compact "*Halosoma*" morphology, without a propodal lamina, and quite distinct from the others. The three remaining species are *A. cribellatus* Calman, 1923 from the Andaman Islands ("about 15"), *A. perforatus* Nakamura and Child, 1982 from Japan ("17 to 25"), and *A. simplex* Clark, 1963 from the east coast of Australia ("22 to 30", see Staples, 1982). They all share most of the other characteristics listed above for the present specimens from the Coral Sea region. While *A. simplex* is described as lacking a propodal lamina (Staples 1982), David Staples has kindly re-examined the specimens held at the National Museum of Victoria and confirms that this species does indeed possess a small distal lamina of the form described by Nakamura and Child (1982: fig. 3f; also Fig. 2B herein).

Nakamura and Child (1982) stated of their *A. perforatus,* "The proposed new species has no other [than the multiple cement gland pores] conspicuous characters to set it apart from many of the genus, but the cement gland number and shape have proved to be sufficiently stable in providing a primary source of differentiation among the many species of *Anoplodactylus*". The present material and *A. simplex* have cement-gland-pore ranges that overlap that of *A. perforatus;* equally, Calman's (1923) statement of "about 15", for a character that is particularly difficult to see and is now known to show some intraspecific variation, also fits within this range (16 is certainly "about 15").

Table 1. Comparison between four forms of *Anoplodactylus* with more than 10 cement gland pores per femur (n.a. - data not available). 3rd leg article lengths expressed relative to femur length, male oviger article lengths relative to length of 2nd oviger article (O2).

	A. cribellatus	*A. perforatus*	*A. simplex*	Coral Sea specimens
Cement-gland pores	"about 15"	17 to 25	22 to 30	16 to 18
Trunk sutures	1st and 2nd	1st and 2nd	1st, 2nd, and 3rd	1st and 2nd
Lateral process armature	nothing apparent	2 or 3 setules	1 or 2 small spines	1 small spine
Propodal heel spines	2+1 pair	1+1	1+1 pair	1+1 pair
Propodal sole setae	8 to 9	10	13	8 to 9
3rd leg, coxa 1	0.23	0.28	0.21	0.25
coxa 2	0.56	0.54	0.56	0.55
coxa 3	0.3	0.39	0.3[a]	0.3
tibia 1	0.94	0.93	0.95	0.95
tibia 2	0.83	0.83	0.81	0.82
propodus	0.45	0.46	0.43	0.4
Main claw:propodus	0.73	0.7	0.69	0.71
oviger: O1	n.a.	0.36	0.3	0.36
O3	n.a.	1.92	1.73	1.87
O4	n.a.	0.71	0.5	0.53
O5	n.a.	0.41	0.4	0.38
O6	n.a.	0.11	0.14	0.15

[a] based on Staples (1982), as Clark's (1963) value for coxa 3 appears to be a misprint (he has it equal to coxa 2, despite his figure showing otherwise).

The morphological characteristics of the three described "species" and the present material are comprehensively compared in Table 1. Article lengths for the oviger (not available for *A. cribellatus*, although what is represented in Calman's (1923) figure is consistent with the others) and the third leg are shown relative to the 2nd oviger article and femur respectively, to compensate for the slightly different sizes of the animals measured. The structures of the legs and oviger are effectively identical among the forms, the numbers of cement gland pores overlap, and the remaining features show such variation as may be expected between populations of a single species, rather than being characters of sufficient value for distinguishing species. Some characters may be less variable than stated: the lateral process setae are very small and may have been missed in the original *A. cribellatus* by Calman (1923).

I therefore conclude that all the material is of a single species, and *A. perforatus* and *A. simplex* are accordingly reduced to junior synonyms of *A. cribellatus*, a species

whose distribution now ranges from the northeastern Indian Ocean to Japan and eastern Australia. Such a zoogeographic pattern is consistent with the Indo-West-Pacific patterns for this genus postulated by Bamber (in press).

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References

Bamber, R. N. (In press). Zoogeographic trends in some Hong Kong arthropods. *In*: Morton, B. (Ed.) *Proceedings of the Third International Conference on the Marine Biology of the South China Sea, Hong Kong 1996*. Hong Kong University Press, Hong Kong.

Calman, W. T. 1923. Pycnogonida of the Indian Museum. Records of the Indian Museum 25 (3): 265-299.

Child, C. A. 1977. On some Pycnogonida of French Oceania. Proceedings of the Biological Society of Washington 90 (2): 440-446.

Child, C. A. 1979. Shallow-water Pycnogonida of the Isthmus of Panama and the coasts of Middle America. Smithsonian Contributions to Zoology 293: 1-86.

Child, C. A. 1995. Antarctic and Subantarctic Pycnogonida: V. The families Pycnogonidae, Phoxichilidiidae, Endeididae, and Callipallenidae, including the genus *Pallenopsis*. Biology of the Antarctic Seas XXIV. Antarctic Research Series 69: 113-163. Washington D.C., American Geophysical Union.

Clark, W. C. 1963. Australian Pycnogonida. Records of the Australian Museum 26 (1): 1-81.

Daniel, A. and Sen, J. K. 1980 [dated 1975]. Studies on the pycnogonids from the collections of the Zoological Survey of India, Calcutta, together with notes on their distribution in the Indian Ocean. Journal of the Marine Biological Association of India 17 (2): 160-167.

Dohrn, A. 1881. Die Pantopoden des Golfes von Neapel und der angrenzenden Meeresabschnitte. Monographie der Fauna und Flora des Golfes von Neapel 3: 1-252.

Kurian, C. V. 1948. A collection of pycnogonids from the Vizhinjam coast. Proceedings of the 35th Indian Science Congress 3: 195.

Kurian, C. V. 1953. A preliminary survey of the bottom fauna and bottom deposits of the Travancore coast within the 15-fathom line. Proceedings of the National Institute of Sciences of India 19 (6): 746-775.

Miyazaki, K. and Makioka T. 1988. Observations on the ovarian structure and oogenesis of some pycnogonids. Proceedings of the Arthropodan Embryological Society of Japan (XXIII annual Meeting, May 22-23, 1987, Sugadaira, Nagano), 1988: 15-16.

Nakamura, K. and Child, C. A. 1988a. Pycnogonida of the Western Pacific Islands, IV: On some species from the Ryukyu Islands. Proceedings of the Biological Society of Washington 101 (3): 662-670.

Nakamura, K. and Child, C. A. 1988b. Pycnogonida of the Western Pacific Islands, V: A Collection by the Kakuyo Maru from Samoa. Proceedings of the Biological Society of Washington 101 (4): 809-816.

Nakamura, K. and Child, C. A. 1991. Pycnogonida from waters adjacent to Japan. Smithsonian

Contributions to Zoology 512: 1-74.
Nakamura, K. and Sekiguchi, K. 1983. Seasonal occurrence of four species of pycnogonids in Nabeta Bay, Shimoda, Japan. Bulletin of the Biogeographical Society of Japan 38 (6): 39-43.
Staples, D. A. 1982. Pycnogonida of the Calliope River and Auckland Creek, Queensland. Memoirs of the Queensland Museum 20 (3): 455-471.
Stock, J. H. 1991. Deep-water Pycnogonida from the surroundings of New Caledonia. *In*: Crosnier, A. (Ed.) *Résultats des Campagnes MUSORSTOM,* Vol 8. Mémoires du Muséum Nationale d'Histoire Naturelle (A) 151: 125-212.
Stock, J. H. 1994. Indo-West Pacific Pycnogonida collected by some major oceanographic expeditions. Beaufortia 44 (3): 17-77.